AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A method to reduce mercury in gas emissions from the combustion of coal in a combustion unit, said method comprising:

a. combusting coal in a primary combustion zone of the combustion unit under conditions of low or no excess oxygen during combustion in the zone wherein the excess oxygen in the combustion zone is no greater than two percent (2%);

b. generating carbon rich fly ash during combustion and entraining the fly ash into flue gas generated by the combustion;

c. releasing mercury during the combustion into the flue gases ~~generated by the combustion~~;

d. staging combustion air by injecting combustion air in a post-combustion zone downstream of the combustion zone in the combustion unit;

e. adsorbing the mercury in the flue gas with the fly ash, and

f. collecting the fly ash with the adsorbed mercury in a combustion waste treatment system.

2. (previously presented) A method as in claim 1 wherein a level of excess oxygen during combustion is less than about 1.0%.

3. (previously presented) A method as in claim 1 wherein a level of excess oxygen during combustion is less than about 0.5%.

4. (previously presented) A method as in claim 1 wherein a level of excess oxygen during combustion is less than a stoichiometric amount of oxygen needed for the combustion of the coal.

5. (previously presented) A method as in claim 1 further comprising cooling the fly ash with the active carbon to a temperature below 450 degrees Fahrenheit to facilitate the adsorption of the mercury.

6. (previously presented) A method as in claim 1 wherein the post-combustion zone includes an overfire burnout zone into which is injected the staged combustion air.

7. (previously presented) A method as in claim 1 wherein the mercury released from combustion is mostly elemental mercury (Hg^0) and further comprising oxidizing the elemental mercury as the flue gases cools.

8. (previously presented) A method as in claim 7 wherein the oxidized mercury is removed from flue gas in a scrubber.

9. (previously presented) A method as in claim 1 wherein the combustion waste treatment system includes a particle control device which captures the fly ash with adsorbed mercury and discharges the captured fly ash to a fly ash collection unit.

10. (previously presented) A method as in claim 1 wherein the combustion waste treatment system includes a particle control device which captures the fly ash after the fly ash cools to a temperature no greater than about 400 degrees Fahrenheit.

11. (previously presented) A method as in claim 1 wherein a loss on ignition level of the fly ash is at least 0.5 percent.

12. (previously presented) A method as in claim 1 wherein a stoichiometric ratio (SR_1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.5 to about 1.1.

13. (previously presented) A method as in claim 1 wherein a stoichiometric ratio (SR_1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.8 to about 1.05.

14. (previously presented) A method as in claim 1 further comprising injecting activated carbon downstream of the post-combustion zone and upstream of the collection of fly ash.

15. (previously presented) A method as in claim 1 further comprising injecting coal into a reburn zone in the post-combustion zone and upstream of an overfire air burnout zone.

16. (previously presented) A method as in claim 14 wherein an amount of reburning fuel is in a range of about 10 to about 30 percent of a total heat input of fuel used for the combustion of coal.

17. (previously presented) A method as in claim 14 wherein an amount of reburning fuel is in a range of about 15 to about 25 percent of a total heat input of fuel used for the combustion of coal.

18. (previously presented) A method as in claim 1 wherein combustion occurs in a low nitrogen oxide (NOx) burner.

19. (previously presented) A method to reduce mercury in gas emissions from the combustion of coal in a combustion system, said method comprising:

a. combusting the coal in a primary combustion zone of the combustion system, wherein elemental mercury (Hg^0) is released in the flue gas produced by the combustion;

b. staging combustion air supplied to the combustion system by adding a portion of the combustion air to the primary combustion zone and a second portion of the combustion air to an overfire air zone downstream of the combustion zone;

c. maintaining a level of excess oxygen in the primary combustion zone of no greater than 1.0 percent so as to release active carbon in the fly ash generated by the combustion of coal and entrained in flue gases from the combustion;

d. oxidizing the elemental mercury by generating oxidized mercury (Hg^{+2});

e. adsorbing the elemental mercury in the flue gas by the active carbon in the fly ash, and

f. collecting the fly ash with adsorbed mercury in a combustion waste treatment system.

20. (currently amended) A method as in claim ~~18~~ 19 wherein a level of excess oxygen during combustion is less than a stoichiometric amount of oxygen needed for the combustion of coal.

21. (currently amended) A method as in claim ~~18~~ 19 further comprising cooling the fly ash with the active carbon to a temperature below 450 degrees Fahrenheit to facilitate the adsorption of the mercury.

22. (currently amended) A method as in claim ~~18~~ 19 further comprising cooling the fly ash with the active carbon to a temperature no greater than 350 degrees Fahrenheit to facilitate the adsorption of the mercury.

23. (currently amended) A method as in claim ~~18~~ 19 wherein the combustion waste treatment system includes a particle control device which captures the fly ash with adsorbed mercury and discharges the captured fly ash to a fly ash collection unit.

24. (currently amended) A method as in claim ~~18~~ 19 wherein the combustion waste treatment system includes a particle control device which captures the fly ash after the fly ash cools to a temperature no greater than 400 degrees Fahrenheit.

25. (currently amended) A method as in claim ~~18~~ 19 wherein a loss on ignition level of the fly ash is at least 0.5 percent.

26. (currently amended) A method ~~as in claim 18~~ to reduce mercury in gas emissions from the combustion of coal in a combustion system, said method comprising:

a. combusting the coal in a primary combustion zone of the combustion system, wherein elemental mercury (Hg^0) is released in the flue gas produced by the combustion;

b. staging combustion air supplied to the combustion system by adding a portion of the combustion air to the primary combustion zone and a second portion of the combustion air to an overfire air zone downstream of the combustion zone to generate excessive active carbon in the fly ash;

c. maintaining a level of excess oxygen in the primary combustion zone of no greater than 1.0 percent so as to release active carbon in the fly ash generated by the combustion of coal;

d. oxidizing the elemental mercury by generating oxidized mercury (Hg^{+2});

e. adsorbing the elemental mercury in the flue gas by the active carbon in the fly ash, and

f. collecting the fly ash with adsorbed mercury in a combustion waste treatment system.

~~further comprising applying air staging by overfire air injection to generate excessive active carbon in the fly ash.~~

27. (currently amended) A method as in claim ~~18~~ 19 wherein a stoichiometric ratio (SR_1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.5 to about 1.1.

28. (currently amended) A method as in claim ~~18~~ 19 wherein a stoichiometric ratio (SR_1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.8 to about 1.05.

29. (currently amended) A method as in claim ~~18~~ 19 further comprising coal reburning in the combustion system to generate carbon in fly ash generated during combustion.

30. (currently amended) A method ~~as in claim 28~~ to reduce mercury in gas emissions from the combustion of coal in a combustion system, said method comprising:

a. combusting the coal in a primary combustion zone of the combustion system, wherein elemental mercury (Hg^0) is released in the flue gas produced by the combustion;

b. staging combustion air supplied to the combustion system by adding a portion of the combustion air to the primary combustion zone and a second portion of the combustion air to an overfire air zone downstream of the combustion zone;

c. maintaining a level of excess oxygen in the primary combustion zone of no greater than 1.0 percent so as to release active carbon in the fly ash generated by the combustion of coal wherein a stoichiometric ratio (SR1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.8 to about 1.05;

d. oxidizing the elemental mercury by generating oxidized mercury (Hg^{+2});

e. adsorbing the elemental mercury in the flue gas by the active carbon in the fly ash;

f. collecting the fly ash with adsorbed mercury in a combustion waste treatment system; and

g. ~~wherein~~ adding an amount of reburning fuel ~~is~~ in a range of about 10 to about 30 percent of a total heat input of fuel used for the combustion of coal.

31. (currently amended) A method ~~as in claim 28~~ to reduce mercury in gas emissions from the combustion of coal in a combustion system, said method comprising:

a. combusting the coal in a primary combustion zone of the combustion system, wherein elemental mercury (Hg^0) is released in the flue gas produced by the combustion;

b. staging combustion air supplied to the combustion system by adding a portion of the combustion air to the primary combustion zone and a second portion of the combustion air to an overfire air zone downstream of the combustion zone;

c. maintaining a level of excess oxygen in the primary combustion zone of no greater than 1.0 percent so as to release active carbon in the fly ash generated by the combustion of coal wherein a stoichiometric ratio (SR1) of the combustion of coal in a primary combustion zone of the combustion system is in a range of about 0.8 to about 1.05;

d. oxidizing the elemental mercury by generating oxidized mercury (Hg^{+2});

e. adsorbing the elemental mercury in the flue gas by the active carbon in the fly ash;

f. collecting the fly ash with adsorbed mercury in a combustion waste treatment system; and

g. ~~wherein~~ adding an amount of reburning fuel is in a range of about 15 to about 25 percent of a total heat input of fuel used for the combustion of coal.

32. (currently amended) A method as in claim ~~18~~ 19 wherein combustion occurs in a low nitrogen oxide (NOx) burner.

33. (currently amended) A system to treat mercury in flue gas emissions from a coal fired furnace comprising:

a) a primary combustion zone receiving combustion air and having a downstream passage for flue gases and fly ash generated during combustion;

b) a coal injector adapted to inject coal into the primary combustion zone;

c) an air injector adapted to introduce combustion oxygen into the combustion zone, wherein an amount of excess oxygen in the zone is no greater than 1.0 percent so as to release active carbon in the fly ash generated by the combustion of coal;

d) an overfire air burnout zone downstream of the combustion zone and included in the downstream passage, wherein combustion air is injected into the burnout zone;

e) a combustion treatment waste system coupled to the flue gas output and a discharge for captured particulate waste, and

wherein said primary combustion zone burns the coal such that the fly ash in entrained in the flue gas and the fly ash has active carbon to adsorb the mercury released in the flue gas.

34. (currently amended) A system as in claim ~~32~~ 33 further comprising a duct downstream of the primary combustion zone to cool the flue gas to collect fly ash with the absorbed mercury.

35. (currently amended) A method to reduce mercury in gas emissions from the combustion of coal in a combustion unit, said method comprising:

a. combusting coal in a combustion zone of the combustion unit under conditions of low or no excess oxygen during combustion in the zone;

b. generating carbon rich fly ash during combustion and entraining the fly ash into flue gases generated by the combustion;

c. releasing mercury during the combustion into the flue gases ~~generated by the combustion~~;

d. adsorbing the mercury in the flue gas with the fly ash, and

e. collecting the fly ash with the adsorbed mercury in a combustion waste treatment system.

36. (previously presented) A method as in claim 35 wherein a level of excess oxygen in flue gas is less than 2.0%.

37. (previously presented) A method as in claim 35 wherein a level of excess oxygen in flue gas is less than 1.0%.

38. (previously presented) A method as in claim 35 wherein oxidized mercury is removed in a scrubber.